

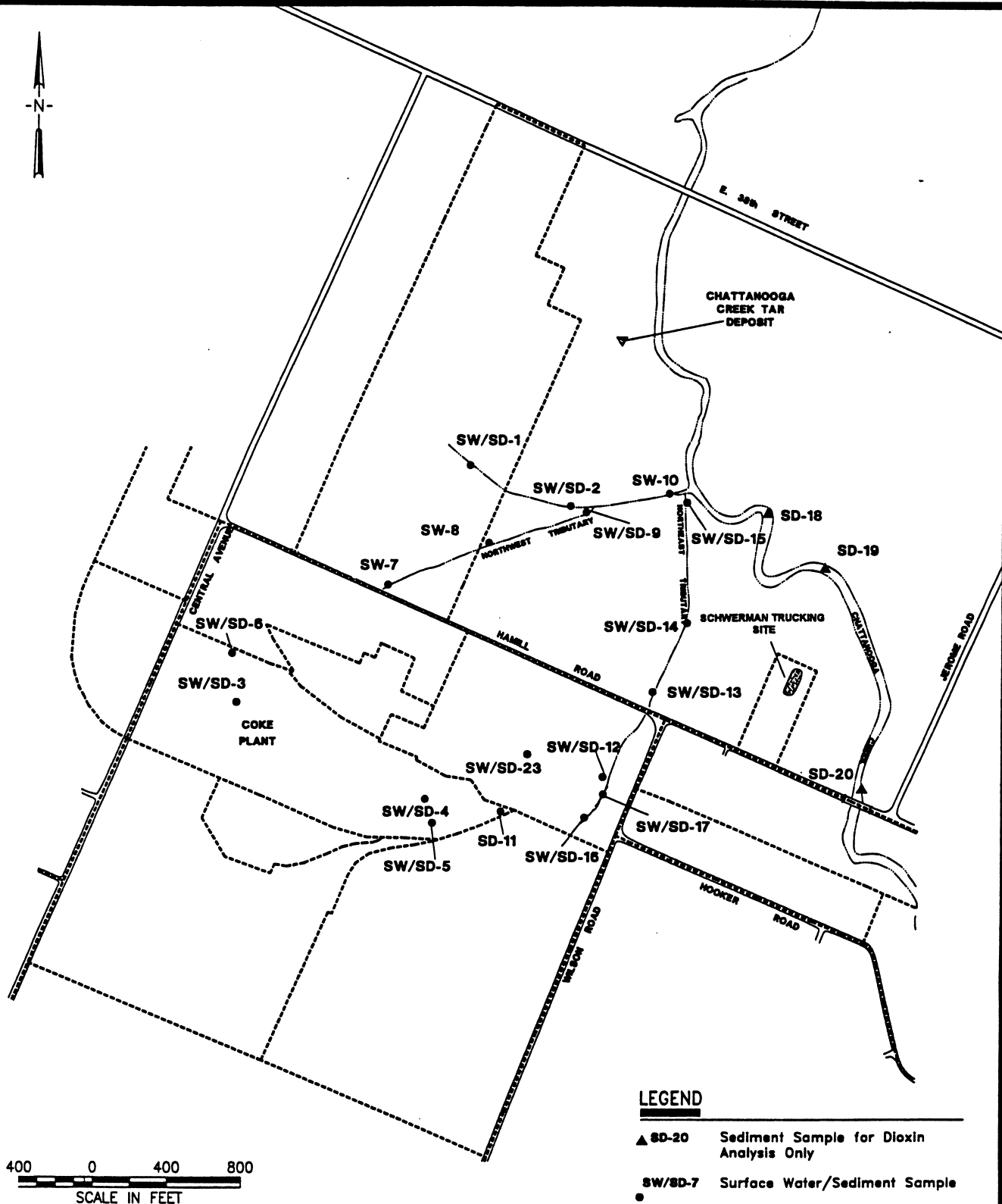
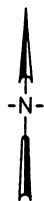
6.0 SURFACE WATER/SEDIMENT INVESTIGATION

6.1 PURPOSE AND SCOPE

Surface water and sediment sampling were conducted at the coke plant, the Northeast Tributary, and the Northwest Tributary to determine the nature and extent of contamination in these areas. Three Chattanooga Creek sediment samples were also collected from areas of known coal tar contamination for dioxin/furan analysis. In addition three surface water samples were collected from the Landes Company property in 1996.

At the coke plant, one sediment and one surface water sample were collected from each of the following three surface impoundments: the API oil water separator (SD/SW-5), the former skimmer ditch (SD/SW-3), and the former surge pond (SD/SW-4). Seven surface water and eight sediment samples were collected from the Northeast Tributary. Seven surface water and three sediment samples were collected from the Northwest Tributary. One of these samples (SW/SD-6) was collected from a spring, located at the north edge of the coke plant, that flows into the Northwest Tributary. In general, both a surface water and a sediment sample were collected from each sampling location. In three locations, however, there was no sediment. In one case there was insufficient surface water to sample. The locations of the surface water and sediment samples collected during the RI field investigation are shown on **Figure 6-1**.

During construction of a new warehouse on the Landes Company property in August 1996, a concrete pipe was uncovered. When the pipe was unplugged, water from the pipe was directed, via a metal pipe, into ditches dug by the construction crew through contaminated soil (see Section 5.3.6). Three surface water samples were collected from the ditches: one at discharging end of the pipe (SW-25), one at the eastern end of the ditch (SW-24), and one from within the ditch (SW-26). An additional water sample (SW-27) was collected from a broken clay pipe found on the south edge of the property. The approximate locations of these samples



SURFACE WATER/SEDIMENT SAMPLE LOCATIONS

Tennessee Products Site
Chattanooga, Tennessee

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc.

FIGURE No. 6-1

are shown on Figure 5-9. Three of the four surface water samples were analyzed for inorganics and organics, however, the fourth sample (SW-27) was only analyzed for volatile organics due to the small volume of water available to sample.

6.2 METHODS

The methods for collecting surface water and sediment samples, and for decontaminating the sampling equipment is described in detail in the *Final Work Plan* (CDM 1995). In general, surface water was collected directly into precleaned sampling containers. Sediment samples were collected with decontaminated bowls and spoons and sent to a CLP laboratory for analysis for TCL organic and TAL inorganic constituents. The three Chattanooga Creek sediment samples and the four surface water samples from the Landes property were sent to a CLP laboratory for dioxin/furan analysis only. The comparison criteria shown in **Table 6-1** were established for determining the presence or absence of contamination in surface water and sediment. For surface water it is assumed that any detection of an organic constituent reflects contamination. Some amount of inorganic constituents would be expected to be found in background surface water. To determine "background" concentrations of inorganic constituents in surface water, samples SW-1 and SW-2 were used. Although these samples are located within the industrial/residential area, they are not hydrologically connected to surface water runoff from the coke plant. The comparison criteria were established as two times the average detected value of each constituent in samples SW-1 and SW-2. This method of establishing comparison criteria is consistent with risk assessment guidance in *Data Collection and Evaluation*, Human Health Risk Assessment Bulletin No.1 (EPA, 1995). In calculating the average, if a constituent was not detected, a value of one half of the detection limit was used.

The comparison criteria used for sediment sample analytical data were derived in the same way as the surface water criteria, except the background data used were from control samples collected from Chattanooga Creek for the *Chattanooga Creek Sediment Profile Study*,

TABLE 6-1
SURFACE WATER AND SEDIMENT
COMPARISON CRITERIA

CONSTITUENT	SURFACE WATER COMPARISON CRITERIA (ug/L)	SEDIMENT COMPARISON CRITERIA (mg/kg)
Silver	3	2.4
Arsenic	3	13
Barium	83	48
Beryllium	1	0.66
Cadmium	2	1.2
Cobalt	3	11
Chromium	3	37
Copper	8	13
Nickel	7	15
Lead	2.5	16
Antimony	25	4
Selenium	4	0.72
Thallium	4	0.48
Vanadium	3	25
Zinc	40	58
Mercury	0.35	0.12
Aluminium	630	6,000
Manganese	420	660
Calcium	110,000	1,607
Iron	845	25,333
Magnesium	7,300	465
Sodium	19,600	87
Potassium	1,940	1030
Cyanide	10	0.08

Note: Surface water criteria are derived from 2 times the average of SW-01 and SW-02 data.

Sediment comparison criteria are 2 times the average concentration of control samples in EPA, 1992.

Sediment criteria for antimony and cyanide are derived from background criteria for surface soil

Chattanooga, Tennessee (EPA, 1992). In that study, however, the samples were not analyzed for cyanide, and the data for antimony analyses were rejected during data validation. Therefore, the comparison criteria used for cyanide and antimony in this RI are the same comparison criteria used for surface soil (see Section 5.3.1).

6.3 SUMMARY

6.3.1 COKE PLANT

The analytical results for the surface water and sediment samples collected at the coke plant are summarized in **Tables 6-2** and **6-3** (surface water), and **Tables 6-4** and **6-5** (sediment). Only constituents that were detected in at least one sample are listed in these tables. Location SW/SD-5 is the API separator, location SW/SD-4 is the former surge pond and location SW/SD-3 is the former skimmer pond. Carbon disulfide, at a concentration of 29 ug/l in SW-5, was the only volatile organic constituent in surface water at the coke plant. Only sample SW-4, from the former surge pond, contained detectable concentrations of semivolatile organic compounds. These compounds included 12 PAHs that have a total concentration of 76 ug/l, and dibenzofuran at a concentration of 4 ug/l. Pesticides were detected in SW-4 (alpha-BHC, 0.05 ug/l) and SW-5 (alpha-BHC, 0.13 ug/l and beta-BHC, 0.074 ug/l). No organic constituents were detected in sample SW-3 from the former skimmer pond.

The concentration of barium, lead, calcium, magnesium, and potassium exceeded the comparison criteria in all three surface water samples. In sample SW-3, criteria for arsenic (8 ug/l), chromium (14 ug/l), aluminum (5000 ug/l), manganese (7000 ug/l), iron (16,000 ug/l), and sodium (38,000 ug/l) were also exceeded. In sample SW-4, all criteria except those for mercury and sodium were exceeded. In addition to the metals mentioned above, sample SW-5 exceeded the criteria for arsenic (8 ug/l). Samples SW-4 and SW-5 contained concentrations of cyanide that exceeded the comparison criteria (350 ug/l and 76 ug/l, respectively).

TABLE 6-2

SURFACE WATER SAMPLING SUMMARY - ORGANICS
COKE PLANT AREA
TENNESSEE PRODUCTS SITE
CHATTANOOGA, TENNESSEE

CHEMICAL	Sample ID:	SW-03	SW-04	SW-05
<u><i>VOLATILE ORGANICS</i></u>				
CARBON DISULFIDE		10U	10U	29
<u><i>SEMIVOLATILE ORGANICS</i></u>				
NAPHTHALENE		10UR	14J	10UR
ACENAPHTHYLENE		10U	3J	10U
ACENAPHTHENE		10U	10U	10U
FLUORENE		10U	2J	10U
PHENANTHRENE		10U	9J	10U
ANTHRACENE		10UR	4J	10UR
BENZO(A)ANTHRACENE		10U	4J	10U
CHRYSENE		10U	5J	10U
BENZO(B &/OR K)FLUORANTHENE		10U	7J	10U
INDENO (1,2,3-CD) PYRENE		10U	6J	10U
BENZO(GHI)PERYLENE		10U	7J	10U
2-METHYLNAPHTHALENE		10U	5J	10U
DIBENZOFURAN		10U	4J	10U
<u><i>PESTICIDES/PCBs</i></u>				
ALPHA-BHC		0.050U	0.050N	0.13N
BETA-BHC		0.050U	0.07U	0.074N

Data Qualifiers:

U=The chemical was analyzed for but not detected. The value preceding the "U" is the minimum quantitation limit.

J=The qualitative analysis of the chemical is acceptable, but the value can not be considered as accurate.

The value preceding the "J" is the estimated value.

UJ=The chemical was analyzed for but was not detected. The value is the estimated quantitation limit.

R = QC indicates that the data are unusable. Chemical may or may not be present.

Concentrations presented in ug/L. Concentrations printed in bold italicized text are considered to reflect a valid detection of unnatural contamination

TABLE 6-3

SURFACE WATER SAMPLING SUMMARY - INORGANICS
COKE PLANT AREA
TENNESSEE PRODUCTS SITE
CHATTANOOGA, TENNESSEE

CHEMICAL	Sample ID:	SW-03	SW-04	SW-05
<u><i>INORGANICS</i></u>				
ARSENIC		<i>8J</i>	<i>100J</i>	8J
BARIUM		<i>87</i>	<i>360J</i>	<i>34J</i>
CADMIUM		2U	<i>6J</i>	3UJ
COBALT		30U	<i>79J</i>	6UJ
CHROMIUM		<i>14</i>	<i>180J</i>	2UJ
COPPER		30U	<i>370J</i>	6UJ
NICKEL		30U	<i>95J</i>	10UJ
LEAD		<i>30</i>	<i>440J</i>	<i>3J</i>
SELENIUM		3U	<i>7J</i>	3UJ
VANADIUM		20U	<i>56J</i>	3UJ
ZINC		150U	<i>990J</i>	70UJ
MERCURY		0.10U	0.22J	0.26J
ALUMINUM		<i>5000</i>	<i>23000J</i>	60UJ
MANGANESE		<i>7000</i>	<i>1500J</i>	540J
CALCIUM		<i>230000</i>	<i>150000J</i>	<i>240000J</i>
IRON		<i>16000</i>	<i>66000J</i>	680J
MAGNESIUM		<i>22000</i>	<i>16000J</i>	<i>14000J</i>
SODIUM		<i>38000</i>	5400J	16000J
POTASSIUM		<i>14000</i>	<i>15000J</i>	<i>4000J</i>
CYANIDE		12J	<i>350</i>	<i>76J</i>

Data Qualifiers:

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TABLE 6-4

SEDIMENT SAMPLING SUMMARY - ORGANICS
COKE PLANT AREA
TENNESSEE PRODUCTS SITE
CHATTANOOGA, TENNESSEE

CHEMICAL	Sample ID:	SD-03	SD-04	SD-05
<u><i>VOLATILE ORGANICS</i></u>				
BENZENE		15U	<i>4J</i>	<i>7800J</i>
<u><i>SEMIVOLATILE ORGANICS</i></u>				
NAPHTHALENE		<i>3000J</i>	<i>89000J</i>	<i>1700000J</i>
ACENAPHTHYLENE		<i>540J</i>	<i>20000J</i>	420000U
PHENANTHRENE		<i>1800J</i>	<i>46000J</i>	<i>470000J</i>
ANTHRACENE		<i>640J</i>	<i>26000J</i>	420000UR
FLUORANTHENE		<i>1900</i>	<i>49000J</i>	440000
PYRENE		2200UR	<i>18000J</i>	<i>210000J</i>
BENZO(A)ANTHRACENE		<i>2000</i>	66000U	420000U
CHRYSENE		<i>2100</i>	<i>15000J</i>	<i>140000J</i>
BENZO(B &/OR K)FLUORANTHENE		<i>1600</i>	<i>31000J</i>	<i>170000J</i>
BENZO-A-PYRENE		<i>1500</i>	66000U	<i>97000J</i>
INDENO (1,2,3-CD) PYRENE		<i>1200</i>	<i>53000J</i>	<i>49000J</i>
BENZO(GHI)PERYLENE		<i>1200</i>	<i>52000J</i>	<i>44000J</i>
2-METHYLNAPHTHALENE		<i>1200</i>	<i>20000J</i>	420000U
DIBENZOFURAN		<i>550</i>	<i>16000J</i>	<i>100000J</i>
(3- AND/OR 4-)METHYLPHENOL		<i>360J</i>	66000U	420000U
CARBAZOLE		<i>290J</i>	66000U	420000U
<u><i>PESTICIDES/PCBs</i></u>				
ALPHA-BHC		6U	60U	<i>100</i>

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UJ=The chemical was analyzed for but was not detected. The value is the estimated quantitation limit.

N=There is presumptive evidence of the presence of the chemical, but the measurement cannot be considered accurate.

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Concentrations presented in ug/kg.

Concentrations printed in bold italicized text are considered to reflect a valid detection of unnatural contamination.

TABLE 6-5
SEDIMENT SAMPLING SUMMARY - INORGANICS
COKE PLANT AREA
TENNESSEE PRODUCTS SITE
CHATTANOOGA, TENNESSEE

CHEMICAL	SD-03	SD-04	SD-05
<i><u>INORGANIC</u></i>			
ARSENIC	16	77	51
BARIUM	140	150	170
BERYLLIUM	2U	2.4	1U
CADMIUM	1U	2.1	2U
COBALT	20U	27	30U
CHROMIUM	38J	920J	94J
COPPER	68	130	140
NICKEL	22	31	27
LEAD	68J	140J	450J
SELENIUM	2.6J	13	4.3J
VANADIUM	20U	31	20U
ZINC	130	340	340
MERCURY	0.86	5.5	3.6
ALUMINUM	5000	13000	7800
MANGANESE	890	780	990
CALCIUM	11000J	16000J	43000J
IRON	27000	32000	35000
MAGNESIUM	1600	1400	2500
POTASSIUM	590	930	890
CYANIDE	3.5	88	11

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N=There is presumptive evidence of the presence of the chemical, but the measurement cannot be considered accurate.

Concentrations presented in mg/kg.

Concentrations printed in bold italicized text are considered to reflect a valid detection of unnatural contamination.

Sediment samples from both the API separator (SD-5) and the surge pond (SD-4) contained detectable concentrations of benzene (7800 ug/kg and 4 ug/kg, respectively). Fourteen PAHs, dibenzofuran, and (3- and/or 4-)methylphenol were detected in at least one sediment sample. Sediment from the API separator contained a total PAH concentration of 2,386 mg/kg. Sample SD-4 collected from the nearby surge pond contained total PAH at a concentration of 419 mg/kg, and the sample from the skimmer pond contained 18.97 mg/kg total PAH. The (3- and/or 4-) methylphenol was only detected in sample SD-3.

Only the oil/water separator sediment (SD-5) contained detectable concentrations of pesticides. Alpha-BHC was detected in that sample at a concentration of 100 ug/kg.

All three sediment samples contained concentrations of arsenic barium, chromium, copper, lead, selenium, zinc, mercury, manganese, calcium, iron, and magnesium that exceed the comparison criteria. These were the only metals that exceeded criteria in samples SD-3. Sample SD-5 also contained concentrations of aluminum that exceeded the criteria, and sample SD-4 contained concentrations of beryllium, cadmium, cobalt, and vanadium above the criteria. Concentrations of cyanide above the criteria were found in all three samples (SD-3, 3.5 mg/kg; SD-4, 88 mg/kg; and SD-5, 11 mg/kg).

6.3.2 NORTHEAST TRIBUTARY

The organic and inorganic analytical results for surface water samples collected from the Northeast Tributary are summarized in **Tables 6-6** and **6-7**. Results for the associated sediment samples are summarized in **Table 6-8, 6-9, and 6-10**. Only constituents that were detected in at least one sample are listed in these tables. The northeast tributary starts at a pond at location SW/SD-16, flows north through a culvert under a railroad track (SW/SD-17, SW/SD-12) where it is joined by contributions of flow from two ditches. One ditch is located on the Landes property (SW/SD-23) and the other is the ditch that runs along the south/east

TABLE 6-6

SURFACE WATER SAMPLING SUMMARY - ORGANICS
NORTHEAST TRIBUTARY
TENNESSEE PRODUCTS SITE
CHATTANOOGA, TENNESSEE

CHEMICAL	Sample ID:	SW-12	SW-13	SW-14	SW-14 (dup.)	SW-15	SW-16	SW-16 (dup.)	SW-17	SW-23
<u><i>VOLATILE ORGANICS</i></u>										
1,1-DICHLOROETHANE		10U	11	10U	10U	10U	10U	10U	10U	10U
TRICHLOROETHENE		10U	9J	10U	4J	10U	10U	10U	10U	10U
BENZENE		10U	10U	10U	10U	10U	10U	10U	10U	2J
TETRACHLOROETHENE		10U	4J	10U	10U	10U	10U	10U	10U	10UJ
TOTAL XYLENES		10U	11	10U	10U	10U	10U	10U	10U	10UJ
CARBON DISULFIDE		6J	10U	10U	10U	10U	10U	10U	10U	10U
1,2-DICHLOROETHENE (TOTAL)		10U	38	11	14	7J	10U	10U	10U	10U
<u><i>SEMIVOLATILE ORGANICS</i></u>										
ACENAPHTHYLENE		1J	10U	10U	10U	10U	10U	10U	10U	10U
PHENANTHRENE		1J	10U	10U	10U	10U	10U	10U	10U	10U
FLUORANTHENE		10	10U	10U	10U	10U	10U	10U	1J	10U
PYRENE		7J	10UR	10UR	10UR	10UR	10UR	10UR	1J	10UR
BENZO(A)ANTHRACENE		5J	10U	10U	10U	10U	10U	10U	10U	10U
CHRYSENE		6J	10U	10U	10U	10U	10U	10U	10U	10U
BENZO(B &/OR K)FLUORANTHENE		6J	10U	10U	10U	10U	10U	10U	10U	10U
BENZO-A-PYRENE		5J	10U	10U	10U	10U	10U	10U	10U	10U
INDENO (1,2,3-CD) PYRENE		4J	10U	10U	10U	10U	10U	10U	10U	10U
BENZO(GH)PERYLENE		5J	10U	10U	10U	10U	10U	10U	10U	10U
<u><i>PESTICIDES/PCBs</i></u>										
ALPHA-BHC		0.4U	0.32	0.19	0.17	0.14	0.050U	0.050U	0.084	0.13
BETA-BHC		0.083N	0.17	0.12	0.11	0.094	0.072	0.082	0.21	0.08U
DELTA-BHC		0.050U	0.12	0.060N	0.06U	0.050U	0.050U	0.050U	0.050U	0.050U

Data Qualifiers:

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TABLE 6-7

**SURFACE WATER SAMPLING SUMMARY -INORGANICS
NORTHEAST TRIBUTARY
TENNESSEE PRODUCTS SITE
CHATTANOOGA, TENNESSEE**

CHEMICAL	Sample ID:	SW-12	SW-13	SW-14	SW-14 (dup.)	SW-15	SW-16	SW-16 (dup.)	SW-17	SW-23
<u><i>INORGANICS</i></u>										
BARIUM		45J	86	66	67	82J	38	27J	67	29
COBALT		63J	30U	20U	20U	30UJ	10U	4UJ	20U	30U
LEAD		15J	5	2U	2U	4J	4	3J	6	2U
ZINC		200J	110U	100U	80U	160UJ	60U	50UJ	180	150U
MERCURY		0.10UJ	0.2U	0.2U	0.2U	0.10UJ	0.1U	0.1UJ	0.1U	0.38
ALUMINUM		4300J	220U	130U	160U	790J	760	920J	1200	570
MANGANESE		8600J	1100	650	640	1000J	2100	1400J	2500	4800
CALCIUM		4600J	82000	79000	82000	62000J	41000	39000J	130000	120000
IRON		3800J	2600	780	750	2600J	2300	2100J	1800	790
MAGNESIUM		6500J	10000	10000	11000	8000J	5600	5600J	12000	12000
SODIUM		5000J	50000	37000	38000	28000J	7100	7100J	11000	19000
POTASSIUM		2300J	21000	15000	15000	15000J	5200	5200J	2400	3700
CYANIDE		480J	16J	24J	20J	17J	10UJ	10UJ	10U	10UJ

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TABLE 6-8

**SEDIMENT SAMPLING SUMMARY - VOCs/PESTICIDES
NORTHEAST TRIBUTARY
TENNESSEE PRODUCTS SITE
CHATTANOOGA, TENNESSEE**

CHEMICAL	Sample ID:	SD-11	SD-12	SD-13	SD-14	SD-14 (dup.)	SD-15	SD-16	SD-16 (dup.)	SD-17	SD-23
<u>VOLATILE ORGANICS</u>											
VINYL CHLORIDE		19U	20UJ	15J	22U	19U	33U	17U	15U	14U	15U
1,1-DICHLOROETHANE		19U	20UJ	26	22U	19U	33U	17U	15U	14U	15U
TRICHLOROETHENE		19U	20UJ	14J	22U	19U	33U	17U	15U	14U	15U
BENZENE		19U	20UJ	17U	2J	19U	20J	17U	15U	14U	15U
TOTAL XYLENES		19U	20UJ	17U	22U	19U	18J	17U	15U	14UJ	15UJ
<u>PESTICIDES/PCBs</u>											
HEPTACHLOR		70	2.4U	60U	20U	39	40U	2.4U	2.4U	3U	22U
HEPTACHLOR EPOXIDE		30U	18	4.9U	1.8U	1.7U	3.2U	2.4U	2.4U	2.4U	22U
ALPHA-BHC		2300N	160U	910	270	430	360	2.4U	2.7N	20U	1000U
BETA-BHC		590	50U	450U	90U	100N	150U	2.4U	2.5	15	280U
DELTA-BHC		140	40	190U	1.8U	160U	3.2U	2.4U	2.4U	2.4U	260
4,4-DDT (P,P-DDT)		49U	6U	90	23	3.4U	53N	4.6U	4.7U	4.6U	130U
ENDRIN		49U	4.7U	600U	140U	350U	130	4.6U	4.7U	4.6U	43U
METHOXYCHLOR		310	34	49U	18U	17U	32U	24U	24U	24U	220U

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Concentrations presented in ug/kg. Concentrations printed in bold italicized text are considered to reflect a valid detection of unnatural contamination.

TABLE 6-9

SEDIMENT SAMPLING SUMMARY - SVOCs
NORTHEAST TRIBUTARY
TENNESSEE PRODUCTS SITE
CHATTANOOGA, TENNESSEE

CHEMICAL	Sample ID:	SD-11	SD-12	SD-13	SD-14	SD-14 (dup.)	SD-15	SD-16	SD-16 (dup.)	SD-17	SD-23
<u>SEMIVOLATILE ORGANICS</u>											
HEXACHLOROETHANE		240000U	4700U	6400U	7200U	6500U	13000U	460U	470U	2300U	13000J
NAPHTHALENE		31000J	1800J	8800J	2600J	2400J	2800J	460UR	470UR	990J	11000UR
ACENAPHTHYLENE		63000J	1500J	11000	4800J	3300J	4300J	460U	470U	2300U	3300J
ACENAPHTHENE		240000U	4700U	6400U	7200U	6500U	13000U	460U	470U	2300U	2200J
FLUORENE		79000J	4700U	11000	7200U	6500U	13000U	460U	470U	2300U	5200J
PHENANTHRENE		310000J	6000J	39000	4800J	7000J	25000J	460U	50J	1200J	15000J
ANTHRACENE		130000J	2300J	15000J	7200UR	3300J	9900J	460UR	470UR	310J	7400J
FLUORANTHENE		720000	14000	50000	23000	18000	42000	110J	130J	1900J	67000J
PYRENE		800000J	8700J	42000J	20000J	15000J	31000J	100J	99J	1900J	52000J
BIS(2-ETHYLHEXYL) PHTHALATE		240000U	4700U	6400U	7200U	6500U	13000U	460U	470U	11000	11000UR
BENZO(A)ANTHRACENE		560000	8600	47000	26000	15000	28000	460U	470U	2300U	32000J
CHRYSENE		460000	6300	32000	11000	11000	21000	460U	66J	1600J	27000J
BENZO(B &/OR K)FLUORANTHENE		340000J	6500J	30000	14000J	11000J	17000J	100J	200J	1800J	45000J
BENZO-A-PYRENE		370000	7100	36000	19000	15000	24000	460U	99J	1500J	6100J
INDENO (1,2,3-CD) PYRENE		220000J	5100	28000	13000	10000	16000	67J	470U	1100J	11000J
DIBENZO(A,H)ANTHRACENE		42000J	4700U	4400J	2700J	2100J	3500J	460U	470U	2300U	11000UR
BENZO(GHI)PERYLENE		210000J	4700J	26000	11000	8800	13000	74J	89J	1100J	12000J
2-METHYLNAPHTHALENE		240000U	4700U	6400U	7200U	6500U	13000U	460U	470U	460J	11000UR
DIBENZOFURAN		30000J	4700U	5600J	1100J	950J	1900J	460U	470U	2300U	2900J
CARBAZOLE		240000U	4700U	5500J	7200U	6500U	13000U	460U	470U	2300U	11000UR

Data Qualifiers:

U=The chemical was analyzed for but not detected. The value preceding the "U" is the minimum quantitation limit.

J=The qualitative analysis of the chemical is acceptable, but the value can not be considered as accurate.

The value preceding the "J" is the estimated value.

UJ=The chemical was analyzed for but was not detected. The value is the estimated quantitation limit.

N=There is presumptive evidence of the presence of the chemical, but the measurement cannot be considered accurate.

Concentrations presented in ug/kg. Concentrations printed in bold italicized text are considered to reflect a valid detection of unnatural contamination.

TABLE 6-10
SEDIMENT SAMPLING SUMMARY - INORGANICS
NORTHEAST TRIBUTARY
TENNESSEE PRODUCTS SITE
CHATTANOOGA, TENNESSEE

CHEMICAL	Sample ID:	SD-11	SD-12	SD-13	SD-14	SD-14 (dup.)	SD-15	SD-16	SD-16 (dup.)	SD-17	SD-23
<u><i>INORGANICS</i></u>											
SILVER		1U	0.88U	14	1.5U	1.5U	2.8U	0.89U	0.85U	0.88U	1U
ARSENIC		21	14	15	13	14	12	5.5	5.7	9.7	8.4
BARIUM		180J	120J	140	170	190	200	78J	79J	150J	59J
CADMIUM		1U	0.32U	3.3	4.7	4.7	5.9	0.32U	0.31U	0.32U	1U
COBALT		8U	17	150	73	77	160	16	15	25	25
CHROMIUM		19J	57J	69J	57J	60J	65J	18J	17J	27J	65J
COPPER		100J	50J	9500	810	940	1800	24J	23J	87J	110J
NICKEL		10U	10U	80	60	63	71	10U	10U	13	38
LEAD		210J	87J	180J	150J	150J	140J	32J	34J	87J	120J
SELENIUM		4.6J	3.7J	7.6	3.1J	3.1J	5.5	1UJ	1UJ	1UJ	2UJ
VANADIUM		16	33	17	31	35	30U	33	33	24	9U
ZINC		300J	81J	950	760	770	950	51J	55J	120J	460J
MERCURY		2	0.33	1.4	0.75	0.71	0.63	0.14	0.2U	0.58	0.1U
ALUMINUM		4300	13000	8600	17000	21000	15000	13000	14000	8800	3100
MANGANESE		370J	590J	840	3300	4300	1900	960J	820J	1600J	900J
CALCIUM		4100J	660J	24000J	8000J	4700J	13000J	1400J	1500J	3200J	17000J
IRON		18000	36000	27000	33000	38000	32000	24000	24000	21000	60000
MAGNESIUM		540J	670J	3000	3100	1600	2000	610J	680J	1100J	1100J
SODIUM		140U	90U	200U	220U	230U	410	70U	60U	80U	80U
POTASSIUM		700	630	820	1100	1400	1600	700	730	760	210
CYANIDE		89	62	6.1	6.3	11	7.9	0.2U	0.2U	1.1	0.81

Data Qualifiers:

U=The chemical was analyzed for but not detected. The value preceding the "U" is the minimum quantitation limit.

J=The qualitative analysis of the chemical is acceptable, but the value can not be considered as accurate.

The value preceding the "J" is the estimated value.

UJ=The chemical was analyzed for but was not detected. The value is the estimated quantitation limit.

N=There is presumptive evidence of the presence of the chemical, but the measurement cannot be considered accurate.

Concentrations presented in mg/Kg. Concentrations printed in bold italicized text are considered to reflect a valid detection of unnatural contamination.

side of the coke plant (SD-11). The tributary flows under Hamill Road to a concrete lined ditch that flows to Chattanooga Creek (SW/SD-13, SW/SD-14, and SW/SD-15).

Seven volatile organic compounds were detected in at least one surface water sample from the Northeast tributary. These compounds include 1,1-dichloroethane, trichloroethene, benzene, tetrachloroethene, total xylenes, carbon disulfide, and 1,2-dichloroethene (total). All but 1,2-dichloroethene were detected in only one sample. Sample SW-13, located just north (downstream) of Hamill Road, contained five out of the seven compounds. Samples SW-16 and SW-17 contained no detectable VOCs. The concentration of 1,2-dichloroethene decreases downstream from 38 ug/l at SW-13, to 11 ug/l at SW-14, and finally 7 ug/l at SW-15 located near the convergence of the tributary with Chattanooga Creek.

Only two surface water samples from the Northeast Tributary, SW-12 and SW-17, contained detectable concentrations of semivolatile organics. Ten semivolatile organic compounds, all of them PAHs, were detected in SW-12. This sample was collected just downstream from the culvert under the railroad track on the Landes Property site. Two PAHs, fluoranthene and pyrene (both at a concentration of 1 ug/l) were detected in sample SW-17 collected from the upstream side of the same culvert.

Three isomers of BHC were detected in the surface water samples from the Northeast Tributary. Beta-BHC was detected in all samples except SW-23 at concentrations ranging from 0.082 ug/l to 0.21 ug/l. There is no discernable pattern to the contamination south of Hamill Road. However, north of Hamill Road, total BHC concentrations decrease from 0.61 ug/l at SW-13 to 0.37 ug/l at SW-14 and 0.234 ug/l at SW-15.

Twelve TAL metals and cyanide were detected in surface water at concentrations exceeding the comparison criteria. Manganese and potassium were found in all samples at concentrations that exceeded their criteria. Concentrations of manganese range from 640 ug/l at SW-14 to 8600 ug/l at SW-12. Lead was detected at concentrations above criteria in all samples except SW-16 and

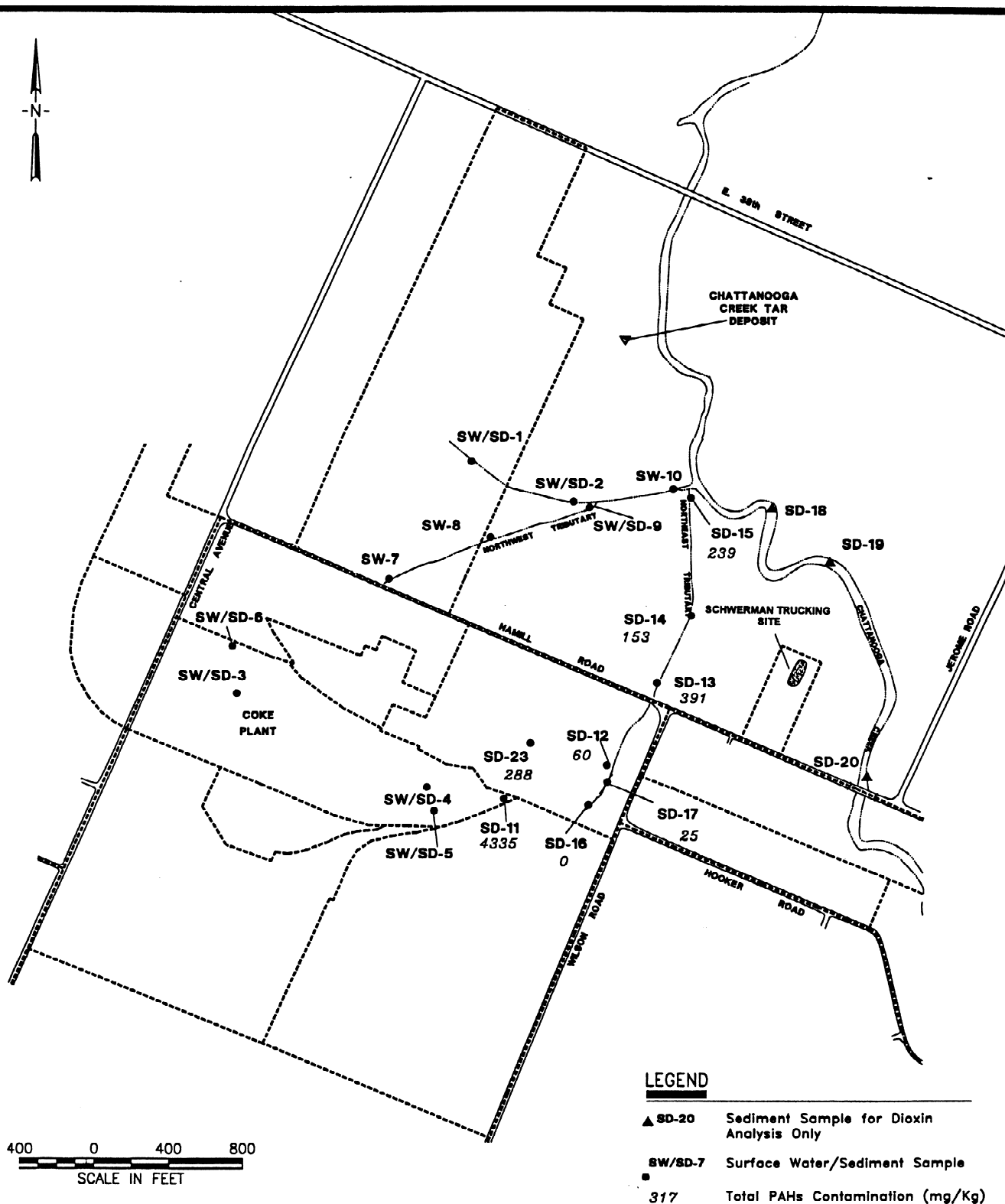
SW-23. Cyanide was detected in SW-12 and in all samples north of that point (SW-13, SW-14, and SW-15).

Only three of the sediment samples collected from the Northeast Tributary contained volatile organic compounds. Sample SD-13 contained vinyl chloride at 15 ug/kg, 1,1-dichloroethane at 26 ug/kg, and trichloroethene at 14 ug/kg. Sample SD-14 contained benzene at 2 ug/kg and sample SD-15 contained benzene at 20 ug/kg and total xylenes at 18 ug/kg. The remaining sediment samples (SD-11, SD-12, SD-16, SD-23) contained no detectable VOCs.

The 20 semivolatile organic compounds that were detected in sediment of the northeast tributary include 18 PAHs, hexachloroethane (detected only in sample SD-23), and dibenzofuran. The only sample that did not have PAHs at concentrations over the comparison criteria was SD-16 collected from the pond at the headwaters of the tributary. The total concentration of PAHs in sediment from this tributary are plotted on **Figure 6-2**.

The highest concentration (4,335 mg/kg) was detected in SD-11, collected from a ditch that runs along the south and east fence of the coke plant property. There was no water in the ditch at the time of sampling, however, flow through the ditch enters the tributary at a point near the railroad culvert south of SD-12. A sample from that location contained 60 mg/kg total PAH. Concentrations were higher (153 mg/kg to 391 mg/kg) in samples collected north of Hamill Road.

Eight pesticides were detected in at least one sediment sample from the northeast tributary: heptachlor, heptachlor epoxide, alpha-BHC, beta-BHC, delta-BHC, 4,4-DDT, endrin and methoxychlor. The largest number and highest concentrations of pesticides were detected in sample SD-11. That sample contained 2300 ug/kg alpha-BHC, 590 ug/kg beta-BHC, 140 ug/kg of delta-BHC, 70 ug/kg of heptachlor, and 310 ug/kg of methoxychlor. Sample SD-15, located near the confluence of the tributary and Chattanooga Creek did not contain any



CONCENTRATION OF TOTAL PAH CONTAMINATION IN SEDIMENT - NORTHEAST TRIBUTARY

Tennessee Products Site
Chattanooga, Tennessee

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc.

FIGURE No. 6-2

measurable concentration of any pesticide. Sample SD-16, located at the headwaters of the tributary, contained only 2.5 ug/kg beta-BHC.

Twenty TAL metals were detected in sediments at concentrations exceeding the comparison criteria. Barium and magnesium were the only metals detected in all samples at concentrations which exceed the comparison criteria. As would be expected, the fewest metals exceeding criteria (10) were found in sample SD-16. The greatest number of metals exceeding criteria (17) were found in all 3 of the sediment samples collected north of Hamill Road (SD-13, SD-14, and SD-15). The highest concentrations of several metals were found in SD-13 (silver at 14 mg/kg, chromium at 69 mg/kg, copper at 9,500 mg/kg, nickel at 80 mg/kg, selenium at 7.6 mg/kg, zinc at 950 mg/kg, and calcium at 24,000 mg/kg) and SD-15 (barium at 200 mg/kg, cadmium at 5.9 mg/kg, zinc at 950 mg/kg, and cobalt at 160 mg/kg). Sample SD-11, located closest to the coke plant contained the highest concentration of lead (210 mg/kg). Cyanide was detected in all sediment samples except SD-16 collected from the pond at the headwaters of the tributary. The two highest concentrations detected, were at SD-11 (89 mg/kg) located in the ditch that runs along the site boundary and SD-12 (62 mg/kg) located at south of the culvert beneath the railroad tracks.

6.3.3 NORTHWEST TRIBUTARY

The organic and inorganic analytical results for surface water samples collected from the Northwest Tributary are summarized in **Tables 6-11** and **6-12**. Results for the associated sediment samples summarized in **Table 6-13** and **6-14**. Only constituents that were detected in at least one sample are listed in these tables. The northwest tributary starts as two branches. The northern branch is a drainage ditch through a neighborhood north of the site (SW/SD-1 and SW/SD-2). The southern branch includes water from a spring located on site (SW/SD-6) and flows through a concrete lined ditch (SW-7, SW-8, SW/SD-9) to a point where it joins the north branch and flows toward Chattanooga Creek (SW-10).

TABLE 6-11

SURFACE WATER SAMPLING SUMMARY - ORGANICS
NORTHWEST TRIBUTARY
TENNESSEE PRODUCTS SITE
CHATTANOOGA, TENNESSEE

	Sample ID:	SW-01	SW-02	SW-06	SW-07	SW-08	SW-09	SW-10
CHEMICAL								
<u>VOLATILE ORGANICS</u>								
CHLOROFORM		10U	2JB	10U	10U	10U	10U	3J
<u>SEMIVOLATILE ORGANICS</u>								
BIS(2-ETHYLHEXYL) PHTHALATE		10U	200J	10U	10U	10U	10U	10U

Data Qualifiers:

U=The chemical was analyzed for but not detected. The value preceding the "U" is the minimum quantitation limit.

J=The qualitative analysis of the chemical is acceptable, but the value can not be considered as accurate.

The value preceding the "J" is the estimated value.

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Concentrations presented in ug/L. Concentrations printed in bold italicized text are considered to reflect a valid detection of unnatural contamination.

TABLE 6-12

**SURFACE WATER SAMPLING SUMMARY - INORGANICS
NORTHWEST TRIBUTARY
TENNESSEE PRODUCTS SITE
CHATTANOOGA, TENNESSEE**

CHEMICAL	Sample ID:	SW-01	SW-02	SW-06	SW-07	SW-08	SW-09	SW-10
<i><u>INORGANICS</u></i>								
BARIUM		43J	40	130	56	59	57	57
COPPER		9UJ	7U	4U	20U	110	60	30U
LEAD		3UJ	2U	1U	2U	3U	4	4
ZINC		60UJ	20U	20U	44	70U	50U	70U
MERCURY		0.1UJ	0.3	0.2U	0.34	0.10UJ	0.2UJ	0.10U
ALUMINUM		590J	80U	30U	40U	140U	210	400U
MANGANESE		330J	90	940	520	490	400	770
CALCIUM		55000J	55000	110000	97000	99000	81000	76000
IRON		760J	170U	1700	440	780	740	1200
MAGNESIUM		3700J	3600	13000	11000	10000	8200	7900
SODIUM		9600J	10000	23000	120000	110000	3000000	69000
POTASSIUM		1000J	980U	2200	2800	2800	3000	2100
CYANIDE		10UJ	10UJ	10UJ	14J	17J	23J	14J

Data Qualifiers:

U=The chemical was analyzed for but not detected. The value preceding the "U" is the minimum quantitation limit.

J=The qualitative analysis of the chemical is acceptable, but the value can not be considered as accurate.

The value preceding the "J" is the estimated value.

UJ=The chemical was analyzed for but was not detected. The value is the estimated quantitation limit.

Concentrations presented in ug/L. Concentrations printed in bold italicized text are considered to reflect a valid detection of unnatural contamination.

TABLE 6-13

SEDIMENT SAMPLING SUMMARY - ORGANICS
NORTHWEST TRIBUTARY
TENNESSEE PRODUCTS SITE
CHATTANOOGA, TENNESSEE

CHEMICAL	Sample ID:	SD-01	SD-02	SD-06	SD-09
<u><i>VOLATILE ORGANICS</i></u>					
1,1-DICHLOROETHENE		12U	28U	23J	12U
CHLOROFORM		20	140	5J	12U
<u><i>SEMIVOLATILE ORGANICS</i></u>					
NAPHTHALENE		130J	9800UR	1900J	4200UR
ACENAPHTHYLENE		81J	9800U	220J	4200U
PHENANTHRENE		2100	3100J	900J	1200J
ANTHRACENE		510J	9800UR	360J	4200UR
FLUORANTHENE		3100	6700J	1300	3100J
PYRENE		3200J	5800J	980J	1700J
BENZYL BUTYL PHTHALATE		1400	9800U	810U	4200U
BENZO(A)ANTHRACENE		2000	9800U	1300U	860J
CHRYSENE		1600	3600J	690J	4200U
BENZO(B &/OR K)FLUORANTHENE		1300	2800J	900J	1000J
BENZO-A-PYRENE		460U	3400J	800J	1000J
INDENO (1,2,3-CD) PYRENE		780	2100J	580J	630J
DIBENZO(A,H)ANTHRACENE		61J	9800U	810U	4200U
BENZO(GHI)PERYLENE		700	2100J	530J	730J
2-METHYLNAPHTHALENE		460U	9800U	640J	4200U
DIBENZOFURAN		120J	9800U	440J	4200U
CARBAZOLE		420J	9800U	810U	4200U
<u><i>PCBs/PESTICIDES</i></u>					
ALPHA-BHC		4U	5.1U	13N	2.8N
PCB-1260		2400	330	42U	130U
ALPHA-CHLORDANE		13	5.1U	2.1U	3.8N

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Concentrations presented in ug/kg. Concentrations printed in bold italicized text are considered to reflect a valid detection of unnatural contamination.

TABLE 6-14

SEDIMENT SAMPLING SUMMARY - INORGANICS
NORTHWEST TRIBUTARY
TENNESSEE PRODUCTS SITE
CHATTANOOGA, TENNESSEE

CHEMICAL	Sample ID:	SD-01	SD-02	SD-06	SD-09
<u><i>INORGANICS</i></u>					
ARSENIC		11	10	22	8.9
BARIUM		140J	160J	490	130J
CADMIUM		1U	3U	6.3	2U
COBALT		20U	30U	51	69
CHROMIUM		27J	27J	16J	36J
COPPER		34J	120J	47	470J
NICKEL		14	33	42	33
LEAD		85J	180J	82J	110J
SELENIUM		1.1UJ	2.1UJ	2.5J	0.94UJ
VANADIUM		17	20U	10U	20
ZINC		420J	910J	490	590J
MERCURY		0.2U	0.41	0.27	0.15
ALUMINUM		5100	8600	4400	5700
MANGANESE		2300J	1500J	24000	1200J
CALCIUM		63000J	68000J	11000J	70000J
IRON		25000	21000	71000	28000
MAGNESIUM		4400J	11000J	1300	6000J
POTASSIUM		450	1100	520	560
CYANIDE		0.2U	0.7U	7.7	1.9

Data Qualifiers:

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UJ=The chemical was analyzed for but was not detected. The value is the estimated quantitation limit.

N=There is presumptive evidence of the presence of the chemical, but the measurement cannot be considered accurate.

Concentrations presented in mg/kg. Concentrations printed in bold italicized text are considered to reflect a valid detection of unnatural contaminants.

Chloroform was the only VOC detected in any of the surface water samples from the Northwest Tributary. This chemical was detected in sample SW-10 at a concentration of 3 ug/l. Similarly, only one semivolatile organic compound, bis(2-ethylhexyl) phthalate, was detected in one sample (SW-2 at 200 ug/l).

Nine metals were detected in surface water samples from the southern branch and downstream section of this tributary (SW-6, SW-7, SW-8, SW-9 and SW-10) at concentrations which exceed the background criteria (note that the background criteria are based on concentrations in SW-1 and SW-2 located in the north branch of this tributary). These metals include barium, copper, lead, zinc, manganese, iron, magnesium, sodium, and potassium. Magnesium, sodium and potassium were found at levels exceeding criteria in all samples. Manganese was detected in all samples except SW-9, at concentrations ranging from 940 ug/l (SW-6) to 490 ug/l (SW-8). Barium exceeds the criteria in sample SW-6 (130 ug/l), and zinc was only detected in SW-7 (44 ug/l). Cyanide was detected in all samples except SW-6, located on the plant property, at concentrations ranging from 14 ug/l to 23 ug/l (at SW-9).

Much of the length of this tributary is lined with concrete and contained no sediment. Only four sediment samples were collected and two of these samples (SD-1 and SD-2) were collected from the north branch of the tributary which could not be impacted by the coke plant. Due to the low number of sediment samples from that part of the tributary that could be impacted by the coke plant, patterns of contaminant distribution can not be easily distinguished.

Volatile organic compounds were detected in all sediment samples except SD-9. Chloroform was detected in SD-1 (20 ug/kg), SD-2 (140 ug/kg) and SD-6 (5 ug/kg). SD-6, collected from the spring in the northwest corner of the coke plant property, also contained 1,1-dichloroethene at a concentration of 23 ug/kg.

Fifteen PAHs, dibenzofuran, and benzyl butyl phthalate were all detected in at least one sediment sample at concentrations which exceed the criteria. Total PAH concentration ranged from 8.420

mg/kg in SD-9 to 29.6 mg/kg in SD-2. Sample SD-6, collected from the spring, contained 9.63 mg/kg.

Two pesticides and one PCB were detected in the sediment samples at concentrations exceeding comparison criteria. These detections include 13 ug/kg alpha-BHC in SD-6, PCB-1260 at 2400 ug/kg in SD-1 and 300 ug/kg in SD-2, and alpha-chlordane at 13 ug/kg in SD-1 and 3.8 ug/kg in SD-9.

Fifteen metals and cyanide were detected in sediment samples from the Northwest Tributary at concentrations exceeding the comparison criteria. Seven of these constituents (barium, copper, lead, zinc, manganese, calcium, and magnesium) were detected at elevated concentrations in all samples. Inorganic constituents that were detected at concentrations exceeding criteria only in samples SD-6 and/or SD-9 include: arsenic (22 mg/kg in SD-6), cadmium (6.3 mg/kg in SD-6), cobalt (51 mg/kg in SD-6 and 69 mg/kg in SD-9), selenium (2.5 mg/kg in SD-6), and cyanide (7.7 mg/kg in SD-6 and 1.9 mg/kg in SD-9).

6.3.4 CHATTANOOGA CREEK SEDIMENTS

The dioxin analytical results for the three sediment samples collected from Chattanooga Creek are summarized on **Table 6-15**. Sixteen dioxins/furans were detected in at least one sample. The TEQs ranged from 130 ng/kg in SD-19 to 4.5 ng/kg in SD-18 (see section 4.3.1 for a discussion of TEQs).

6.3.5 LANDES PROPERTY

The analytical results of the four surface water samples collected on the Landes Company property are shown in **Tables 6-16 and 617**. The suite of VOCs that were detected in the

Table 6-15

TABLE 6-15

**SEDIMENT SAMPLING SUMMARY - DIOXIN/FURANS
CHATTANOOGA CREEK SEDIMENTS
TENNESSEE PRODUCTS SITE
CHATTANOOGA, TENNESSEE**

CHEMICAL	Sample ID:	SD-18	SD-19	SD-20
<u><i>DIOXINS/FURANS</i></u>				
TETRACHLORODIBENZODIOXIN (TOTAL)		5.0UJ	500UJ	13J
1,2,3,4,7,8 HEXACHLORODIBENZODIOXIN		12U	1200U	6.2J
1,2,3,6,7,8 HEXACHLORODIBENZODIOXIN		12U	1200U	5.5J
HEXACHLORODIBENZODIOXIN (TOTAL)		10J	1200UJ	46J
1,2,3,4,6,7,8 HEPTACHLORODIBENZODIOXIN		56	560J	100
HEPTACHLORODIBENZODIOXIN (TOTAL)		130J	1200J	250J
OCTACHLORODIBENZODIOXIN (TOTAL)		3900	4400J	4300
TETRACHLORODIBENZOFURAN (TOTAL)		10UJ	5000J	1800J
1,2,3,7,8 PENTACHLORODIBENZOFURAN		12U	150J	9.4J
2,3,4,7,8 PENTACHLORODIBENZOFURAN		12U	210J	30U
PENTACHLORODIBENZOFURAN (TOTAL)		12UJ	5100J	300J
1,2,3,6,7,8 HEXACHLORODIBENZOFURAN		12U	1200U	4.7J
HEXACHLORODIBENZOFURAN (TOTAL)		12UJ	1800J	130J
1,2,3,4,6,7,8 HEPTACHLORODIBENZOFURAN		12U	520J	37
HEPTACHLORODIBENZOFURAN (TOTAL)		12UJ	620J	50J
OCTACHLORODIBENZOFURAN (TOTAL)		25U	480J	50U
TEQ (TOXIC. EQUIV. VALUE, FROM I-TEF/89)		4.5	130J	7.8

Data Qualifiers:

U=The chemical was analyzed for but not detected. The value preceding the "U" is the minimum quantitation limit.

J=The qualitative analysis of the chemical is acceptable, but the value can not be considered as accurate.

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Concentrations presented in ng/kg. Concentrations printed in bold italicized text are considered to reflect a valid detection of unnatural contamination.

TABLE 6-16

SURFACE WATER SAMPLING SUMMARY - ORGANICS
LANDES COMPANY PROPERTY
TENNESSEE PRODUCTS SITE
CHATTANOOGA, TENNESSEE

CHEMICAL	Sample ID:	SW-24	SW-24 (dup.)	SW-25	SW-26	SW-27
<u>VOLATILE ORGANICS</u>						
BENZENE		88	97	29	1700	10U
TOLUENE		45	46	23	1400	10U
CHLOROBENZENE		29	35	10J	420	10U
ETHYL BENZENE		3J	4J	10U	71J	10U
TOTAL XYLENES		34	36	10	510	10U
ACETONE		10U	20	20U	200U	10U
<u>SEMIVOLATILE ORGANICS</u>						
1,3-DICHLOROBENZENE		1J	2J	10U	1J	NA
1,4-DICHLOROBENZENE		6J	7J	1J	11	NA
1,2-DICHLOROBENZENE		2J	2J	10U	6J	NA
NAPHTHALENE		10U	4J	3J	1600	NA
ACENAPHTHYLENE		10	6J	2J	30	NA
ACENAPHTHENE		140	110	23	260	NA
FLUORENE		170	130	23	200	NA
PHENANTHRENE		180	100	19	190	NA
ANTHRACENE		29	24	5J	31	NA
FLUORANTHENE		68	62	26	27	NA
PYRENE		50	34	17	19	NA
BENZO(A)ANTHRACENE		15	11	6J	3J	NA
CHRYSENE		12	9J	7J	2J	NA
BENZO(B &/OR K)FLUORANTHENE		22J	14J	10U	2J	NA
BENZO-A-PYRENE		11	8J	5J	1J	NA
INDENO (1,2,3-CD) PYRENE		6J	4J	3J	10U	NA
DIBENZO(A,H)ANTHRACENE		2J	1J	10U	10U	NA
BENZO(GH)PERYLENE		6J	4J	3J	10U	NA
2-CHLOROPHENOL		10U	10U	10U	4J	NA
2,4-DIMETHYLPHENOL		17	13	10U	260	NA
2,4-DICHLOROPHENOL		1J	10U	10U	4J	NA
2,4,6-TRICHLOROPHENOL		10U	10U	10U	2J	NA
4-CHLORO-3-METHYLPHENOL		3J	2J	10U	10U	NA
2-METHYLNAPHTHALENE		7J	2J	2J	600	NA
DIBENZOFURAN		110	78	12	190	NA
2-METHYLPHENOL		41	30	14	390	NA
(3- AND/OR 4-)METHYLPHENOL		30	20	6J	490	NA
CARBAZOLE		160	100	35	500	NA
<u>PESTICIDES</u>						
ALPHA-BHC		1.2NJ	0.97J	0.73J	2.8J	NA
BETA-BHC		0.99J	1.1J	0.23J	0.28J	NA
GAMMA-BHC (LINDANE)		0.05UJ	0.05UJ	0.25J	0.90UJ	NA
4,4-DDT (P,P-DDT)		0.10UJ	0.10UJ	0.10UJ	0.05J	NA

Data Qualifiers:

U=The chemical was analyzed for but not detected. The value preceding the "U" is the minimum quantitation limit.

J=The qualitative analysis of the chemical is acceptable, but the value can not be considered as accurate.

The value preceding the "J" is the estimated value.

UJ=The chemical was analyzed for but was not detected. The value is the estimated quantitation limit.

N=There is presumptive evidence of the presence of the chemical, but the measurement cannot be considered accurate.

Concentrations presented in ug/l.

Concentrations printed in bold italicized text are considered to reflect a valid detection of unnatural contamination.

TABLE 6-17

SURFACE WATER SAMPLING SUMMARY -INORGANICS
LANDES COMPANY PROPERTY
TENNESSEE PRODUCTS SITE
CHATTANOOGA, TENNESSEE

CHEMICAL	Sample ID:	SW-24	SW-24 (dup.)	SW-25	SW-26	SW-27
<u><i>INORGANICS</i></u>						
ARSENIC		<i>25J</i>	<i>19J</i>	<i>8UJ</i>	<i>32J</i>	NA
BARIUM		<i>410</i>	<i>300</i>	<i>430</i>	<i>540</i>	NA
BERYLLIUM		1J	1J	1U	1J	NA
CADMIUM		<i>8</i>	2J	1U	<i>4J</i>	NA
COBALT		<i>16J</i>	<i>6J</i>	<i>4J</i>	<i>28J</i>	NA
CHROMIUM		<i>13</i>	<i>5J</i>	3J	<i>33</i>	NA
COPPER		<i>320</i>	<i>62</i>	<i>25</i>	<i>200</i>	NA
NICKEL		40U	20U	10U	<i>48</i>	NA
LEAD		<i>160</i>	<i>41</i>	<i>19</i>	<i>180</i>	NA
ANTIMONY		2.9J	3U	6U	3U	NA
SELENIUM		2U	2U	2U	2J	NA
VANADIUM		<i>17J</i>	<i>9J</i>	3J	<i>48J</i>	NA
ZINC		<i>2500</i>	<i>230</i>	<i>570</i>	<i>570</i>	NA
MERCURY		<i>0.44J</i>	0.10UJ	0.10UJ	0.2UJ	NA
ALUMINUM		<i>6500</i>	<i>2900</i>	<i>1200</i>	<i>27000</i>	NA
MANGANESE		<i>3500</i>	<i>2400</i>	<i>1300</i>	<i>4000</i>	NA
CALCIUM		<i>190000</i>	<i>170000</i>	<i>130000</i>	<i>190000</i>	NA
IRON		<i>31000</i>	<i>20000</i>	<i>3500</i>	<i>47000</i>	NA
MAGNESIUM		<i>30000</i>	<i>29000</i>	<i>29000</i>	<i>25000</i>	NA
SODIUM		<i>73000</i>	<i>75000</i>	<i>110000</i>	<i>100000</i>	NA
POTASSIUM		<i>84000</i>	<i>87000</i>	<i>4700</i>	<i>54000</i>	NA
CYANIDE		<i>380</i>	<i>40</i>	<i>13</i>	<i>330</i>	NA

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Concentrations presented in ug/L.

Concentrations printed in bold italicized text are considered to reflect a valid detection of unnatural contamination

surface water samples collected from the ditches was very similar to that detected in the contaminated soil in the area. Sample SW-86 contained the highest concentration of each constituent: benzene (1700 ug/l), ethylbenzene (71 J ug/l), chlorobenzene(420 ug/l), toluene (1400 ug/l) and total xylenes (510 ug/l). Sample SW-25 did not contain ethylbenzene. The sample collected from the broken clay pipe located in the southern portion of the site did not contain any VOCs (the only analytes analyzed for this sample).

As would be expected, several PAHs were detected in the surface water samples. These PAHs are similar those detected in the soil through which the ditches had be excavated. In addition to the PAHs all of the samples contained 1,4-dichlorobenzene, 2-methylnaphthalene, dibenzofuran, 2-methylphenol, (3-and/or 4-)methylphenol, and carbazole.

Trace levels of alpha-BHC and beta-BHC were detected in all three ditch samples. Sample SW-26 also had a trace level (0.05 J ug/l) of 4,4-DDT and SW-25 had a trace level (0.25J ug/l) of lindane.

Inorganic constituents detected at elevated concentrations include arsenic, barium, cadmium, cobalt, chromium, copper, nickel, lead, mercury, vanadium, zinc and cyanide.